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# Telework: Coming of Age? Evaluating the Potential Benefits of Telework

## Introduction

Computers, the Internet, and other forms of information technology have already changed the way we work and live. The mass infusion of information technology into the economy has profound impacts on labor supply and demand, and on the education and training institutions preparing people for work. Our “digital economy” could revolutionize the way we communicate, learn, and work. It could also alter the way our society addresses such social problems as unemployment and illiteracy.

Information technology now profoundly shapes American culture at least for the middle class. Daily examples of information technology’s grip on the nation include technology sections in every broad circulation newspaper and magazine, intense attention to the ups and downs of dot.com stocks, and television advertisements for Internet job sites during mass culture events, such as the Olympics and the Superbowl. The exchange of email addresses in addition to, or instead of, phone numbers is now common practice for many Americans.

Eight years of sustained economic growth, low unemployment, high labor force participation rates, increasing real wages, and increasing work weeks for many have created new “challenges.” Namely, the American worker who is stressed out and looking for new strategies to accomplishing their 24 by 7 by 365 jobs while still enjoying their personal and family lives.

These two powerful trends — widely available information technology and workers hoping to balance work and family — have generated strong interest in the potential value of telecommuting to work or “telework.” There is no commonly accepted definition of telecommuting or telework within the scholarly literature or within government agencies or private firms. The popular media typically use telecommuting and telework interchangeably to describe any nontraditional work arrangement. Academics and other experts apply narrower definitions for the purpose of measurement.

In this paper, the term “telework” is defined as *working at home, away from an employer’s place of business, using information technology appliances, such as the Internet, computers, or telephones.*

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Teleworkers include people who work at home full-time or part-time and those who work at a remote location other than their employer's central office full-time or part-time. Excluded from our definition are people who own homebased businesses and conduct much of their work from their private residences and the purely "mobile workforce," the traveling sales force and consultants of the 21<sup>st</sup> Century.

Teleworkers have been part of the workforce for a long time, albeit using low-tech information technology. Ever since there was paperwork to be brought home and a telephone to call colleagues and clients, telework has been conducted in the United States. What is new, of course, is that the widespread availability of contemporary information technology devices. Millions of people are now able to accomplish, from their residences, a wide range of complex tasks in collaboration with colleagues and others around the world. Equipped with laptop computers, hand held Internet appliances, fax machines, voicemail, email, and other technologies, a new "anytime, anywhere" work culture is emerging.

Although estimates vary, the consensus view is that approximately 10% of the workforce in 2000 are teleworkers (using the above stated definition). The ranks of teleworkers could increase dramatically in the coming years if technology continues to improve and if workers and their managers fully embrace new models of work.

Gaining a better understanding of telework is important for several reasons. First, increases in teleworkers could have profound impacts on worker behavior and satisfaction, employer profitability, and preferred management practices. To remain competitive in the global market, American workers and employers must continue productivity gains. Telework arrangement may represent an opportunity to increase productivity and worker satisfaction. If further research establishes the positive benefits of telework, traditional management models will have to change. The question then becomes, what management practices will be most effective in the new digital culture?

Second, the digital economy generates millions of jobs that could be conducted in workers' homes either all or part of the workweek. More than two-thirds of all workers use a computer in the workplace every day, according to research conducted by the John J. Heldrich Center for Workforce Development.<sup>1</sup> The explosive growth of e-commerce and the Internet have created strong demands for workers with information technology skills. These high-end information sector jobs, and their retail counterparts, such as customer service support and data processing, represent major growth sectors in the economy with "teleworkable" jobs. One important question for future research should be, how will we prepare the workforce and businesses to take advantage of these new opportunities and develop career paths for the teleworker?

Third, aggressive marketing of inexpensive, high bandwidth, secure Internet connections (DSL, cable, satellite) means that telework is much more affordable than it was just two or three years ago. Millions more workers are able to access high bandwidth, secure Internet sites because their corporate LANs and phone systems can be accessed remotely at affordable price. The percentage of Internet users with broadband access is expected to triple from 7% to 21 % from 2000 to 2003, according to an analysis reported in Business 2.0.<sup>2</sup>

**Table 1: The Projected Percentage of Internet Users with Broadband Access  
1999 - 2003**

<b>Year</b>	<b>Millions of Broadband Users</b>	<b>Millions of Internet Users</b>	<b>Percent Internet Users with Broadband</b>
1999	2.5	58	4%
2000	5.51	75.75	7%
2001	10.98	90	12%
2002	17.77	103.88	17%
2003	25.09	118.25	21%

These projections could increase substantially if American businesses decide to promote telework options for large numbers of their employees.

Fourth, telework can have important implications for helping low- and moderate-income workers and potentially bridging the digital divide. Despite the strong economy and overall low unemployment rate, millions of residents in urban and isolated rural and Native American communities remain unemployed and three out of every four severely disabled Americans are unemployed. Telework could provide promising opportunities to these and other groups on the wrong side of the digital divide by helping them overcome traditional transportation barriers and bringing access to technology into their communities. These workers would be able to work from home or from neighborhood telework centers that would link them with valuable job opportunities as well as bring technology infrastructure into low-income communities. Telework may also provide a viable solution for working parents who cannot afford to pay childcare expenses. Given its potential benefits, there is a strong public interest in learning more about how telework can be effectively applied to ameliorate important social problems.

Finally, increasing telework may be a valuable component in reducing traffic congestion and air pollution, especially in urban communities. Telework has been shown to have positive impacts by reducing work trips and overall travel, but little is known about the longterm effects of these changes in travel behavior and residential choice decisions. It is possible that telework may promote further deconcentration of housing in the long run and thus increase vehicle miles traveled for non-work trips while reducing congestion in peak hours during the work commute.

### **The Triple Bottom Line**

Telework holds the potential to affect the “triple bottom line” of financial, environmental, and social goals.<sup>3</sup>

#### **The Human Resource and Financial Bottom Line**

Increasing telework opportunities may positively affect employee recruitment, retention, absenteeism, and productivity and thus improve the financial bottom line. Recent studies also claim that telework pro-

grams reduce building and parking costs. The flexibility afforded by teleworking enables employees to attend to emergent problems, such as a sick child, and to continue working during inclement weather.

The research is far from definitive, but several studies evaluating the impact of teleworking are promising. One study concluded that employees who telework save their employers up to \$10,000 per year in reduced absenteeism and retention costs.<sup>4</sup> Another found that telework reduces absenteeism costs by 63%, or an average of savings over \$2,000 per employee.<sup>5</sup>

Evidence about the impact of telework on productivity is also encouraging. Workers and employers tell survey researchers that they are more productive when permitted to telework for at least part of the work week. In a series of national “Work Trends” surveys conducted by the John J. Heldrich Center for Workforce Development at Rutgers University and the Center for Survey Research and Analysis at the University of Connecticut (hereafter referred to as *Work Trends*), 40% of American workers say that their productivity increased when working outside the office, and another 30% said they were at least as productive at home as they were in the office.<sup>6</sup> Similarly, in surveys conducted by the America National Telework Study, close to half (47%) of teleworkers claimed they are more productive working at home than at their conventional work locations; 42% said their productivity remains the same.<sup>7</sup>

Employers also report productivity gains from teleworkers. An evaluation of the State of Arizona’s telecommuting program found that senior managers cited increased efficiency, greater productivity, and enhanced employee morale as the greatest benefits of the program.<sup>8</sup> In addition, an assessment of 12 pilot telework programs operated in the private and public sectors (including Apple Computer, AT&T, and the State of California) found that, “by all measures, productivity changes were positive” and that most supervisors reported increased or the same productivity among their teleworking employees.<sup>9</sup>

Telework may also be a valuable tool in attracting and retaining employees. The *Work Trends* national survey found that 59% of employees would telework for all or part of the week if offered the option by their employer.<sup>10</sup> In another national study by Telework America, more than half (53%) of teleworkers surveyed said it is “important” or “extremely important” to have the ability to work at home at least some of the time when considering a new employer.<sup>11</sup> In addition to attracting new talent, existing employees may be more likely to remain at their current job if given the opportunity to telework all or part of the week.

Telework programs can also lower overhead expenses for companies, according to telework consultant Gil Gordon.<sup>12</sup> For some firms, telework programs have reduced office space needs. AT&T, for example, estimates that its telework program saved them \$500 million since 1991.<sup>13</sup> IBM reported savings of \$1 billion on real estate costs from 1992 to 1997.<sup>14</sup> While some companies can realize immediate overhead savings, most companies will use telework to save on future real estate costs. For example, American Express Travel reports significant reductions in space needs due to increases in teleworking by their workforce.<sup>14</sup>

The limited collection of available research suggests that telework effectively addresses many important human resource challenges faced by employers in the new economy. However, more research must be conducted to assess telework's impact on productivity, recruitment, retention, and absenteeism, especially in the long term. Also needed are more careful evaluations of the management practices that measure and bolster the productivity of teleworkers.

### **Social Bottom Line**

Telework strategies can also be used to address workforce equity issues facing the country, such as high unemployment in low-income urban and rural communities, high unemployment among individuals with disabilities, bridging the digital divide, and the child care challenge of working parents.

Individuals with disabilities and low-income individuals in many urban and rural communities share a common barrier to success in the labor market — transportation. With the dispersion of jobs to the suburbs, many working poor and unemployed individuals from low-income urban communities cannot afford to own and operate the automobile necessary for an urban to suburban commute. Few transportation networks available to individuals with disabilities provide adequate service to suburban employment locations.

In a *Work Trends* study of the working poor (defined as those earning at or below 200% of the poverty level), respondents said that their location presented a significant barrier to their success in the labor market. Nearly nine in ten (88%) of the working poor expressed the need for better jobs in their community. In looking to solutions, working poor Americans look favorably on policies designed to address the mismatch between where they live and where desirable jobs are located. Nearly two-thirds said they would telework if given the option, and three-fourths said they would use on-site childcare if it were available. Forty-one percent stated they would take public transit if it met their work commute needs.<sup>15</sup>

The United States Department of Commerce study, *Falling Through the Net II*, reports on the computer “haves” and “have nots.” Households earning more than \$75,000 annually are 9 times as likely to have home computer access compared to households earning less than \$15,000.<sup>16</sup> College educated individuals are 16 times more likely to have Internet access than are individuals lacking a high school education. Whites are twice as likely as Blacks and Hispanics to have home computer access. Accordingly, lower income, less educated, and racial minorities are the least likely groups to have access to technology and the Internet. The technology gap further isolates already racially and economically segregated communities, thus exacerbating an already distressed situation. The Office of Technology Assessment (OTA) described this effect as “the concentration of poverty and the de-concentration of opportunity.”<sup>17</sup>

The advent of new technologies enables companies to decentralize their operations to suburban locations close to skilled labor forces. This “spatial mismatch” leaves individuals who might otherwise use technology on the job and develop technical skills without the opportunity to do so. Without access to information technology tools, residents are unable to acquire the necessary skills for the new economy, which subsequently impedes future economic development for the entire community.

Furthermore, telecommunications tools can be used to encourage civic engagement. As suggested by the Benton Foundation:

[A]ny of the associations people form to address specific issues can facilitate coordination and communication, foster the emergence of leaders who can help generate collective action . . . the resulting ‘social capital’ can enable communities to deal more successfully with social problems. Communities without access to communications networks may find it more difficult to sustain the civic engagement that can lead to these improved outcomes.<sup>18</sup>

If already isolated communities are expected to sustain and grow, they need access to the benefits of information technology.

Telework may have the capacity to overcome geographic isolation from desired labor markets and help bridge the digital divide. Such strategies could not only consist of working from residences, but also include establishing neighborhood telework. The creation of urban telework centers can counteract the dispersal of jobs from urban areas by creating opportunities for employers to relocate their customer service and back office functions to central cities or rural communities. Some of the advantages telework centers offer to this particular workforce include: close proximity to workers’ homes, flexible work hours, comparatively low entry-level skill requirements in typing and computer competence, a professional environment for skill development and increased marketability, and potential job laddering opportunities within the call center industry. “High end” customer services call center workers can earn \$13-20 per hour. In addition, telework centers can bring much needed technology infrastructure into “digitally divided” communities. This fixed capital investment can be used in nonwork hours to provide computer skills training, access to distance education, and access to the Internet.

Research on the impact of telework for individuals with disabilities is also promising. For example, Doug Kruse and Mary Anne Hyland’s analysis of 1991 and 1997 Current Population Survey (CPS) data found that the “growth of paid home-based work has been greater among workers with disabilities, resulting in 15% doing such work in 1997 compared to 10% of workers without disabilities.”

They suggest that “there remains large potential to expand employment opportunities for people with disabilities through home-based work,” and that the use of computers in home-based work can offer special advantages to people with disabilities such as ameliorating or making irrelevant some of the limitations created by disability. However, the low level of computer use among home-based employees with disabilities suggests that employers and employees are not taking full advantage of these opportunities.<sup>19</sup>

### *Research Issues*

The idea of increasing employment rates in urban and rural communities by encouraging telework is a promising, if untested strategy. The proliferation of customer service, e-commerce call centers provides an opportunity to study their impact on low-income job seekers, when such centers locate in urban communities or in isolated rural communities. Federal and state governments may wish to encourage and then

evaluate this economic development strategy by partially funding public-private partnerships to conduct feasibility studies and capitalize telework centers that employ low-income individuals.

In addition, more research about the potential for telework to employ individuals with disabilities needs to be conducted. A more detailed understanding of the specific occupations and associated skills/proficiencies that would be appropriate for individuals with different types of disabilities is necessary to move from theory to practice.

## **Environmental bottom line**

Reducing congestion and the associated environmental benefits are often cited as the principal reasons for initiating telework programs. While there is some evidence about short-term environmental benefits, long-term benefits are less clear. Several telework pilot programs have achieved significant reductions in work trip vehicle miles, which reduce the amount of carbon dioxide (CO<sub>2</sub>) released into the environment. For example, the Puget Sound Telecommuting Demonstration travel log data show reductions of 36 miles per telecommuting occasion (each day a person teleworks), a 61% reduction in daily travel. Using various models for measuring the reduction in pollutant emissions, daily reductions of 50-70% occur on teleworking days. A pilot conducted by the Southern California Association of Governments (SCAG) found that teleworking reduced travel by an average of 46 miles per trip; in Hawaii, almost all (93%) of employees reported a reduced number of work trips and an average drop of fuel consumption by 29% over the course of a year.<sup>21</sup>

## *Research Issues*

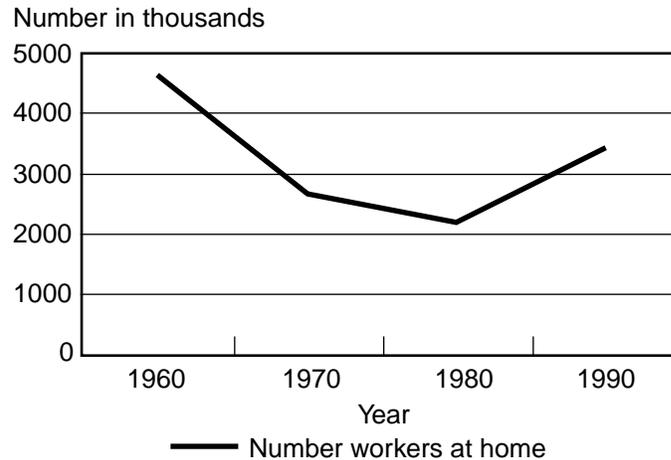
While short-term studies of the environmental impacts of teleworking are encouraging, they cannot predict the long-term effects of these programs on residential and employment location decisions or travel behavior. Telework enhances flexibility, dispersion and mobility and cannot be viewed solely as a substitution for travel to the office. For example, teleworkers may choose to live farther away from employers because they commute only a couple of days or no days at all. A more dispersed population increases vehicle miles traveled and could actually increase congestion. Telework, therefore, actually acts more as a demand management strategy rather than a travel reduction strategy. Future research must carefully assess the long-term impacts of telework.

## **Telework: Yesterday and Today**

### **The Evolution of Telework**

Over 200 years ago, the majority of Americans worked at homes on their farms. Not until the advent of mass production in the late 19<sup>th</sup> and early 20<sup>th</sup> centuries did the mass of workers begin leaving their homes and their farms, traveling to factories, offices, and other places of employment outside the home. By the mid-20<sup>th</sup> century, the telephone had become widely available in American homes. Although the ability to

## Workers Who Worked At Home: 1960 -1990



telework has existed for decades, research on the practices and patterns of teleworking did not begin appearing until the 1970s. Before then, people simply “worked from home,” perhaps using the telephone, but primarily reading and doing paperwork. There is no empirical data on the number and demographic characteristics of these pioneer teleworkers, but, most likely, they were senior executives or professionals, with control over their schedules, and with reading and paperwork tasks. In 1960, the federal government began to collect data on the number of persons working from home, an imperfect proxy for the number of teleworkers because this number includes those for whom their principal place of employment is out of the home. While these data dramatically overstate the percentage of teleworkers, they are still modest.<sup>22</sup>

In the 1970s, Jack Nilles directed the first telework demonstration project, partially funded by the National Science Foundation, and coined the terms “telecommuting” and “teleworking.” In 1980, the first “telecenter” was established in Marne-la-Valle, France. The second was established in Nykvarn, Sweden in 1982 and the third in Benglen, Switzerland in 1985. Pilot telework programs were initiated in the 1980s in the United States, often with encouragement and funding from the federal government. In the 1990s, the federal government instituted a government-wide telework pilot project and many states and local governments as well as private sector corporations instituted telework programs and published results from their experience. In 1996, the federal government embarked on the National Telecommunications initiative, which has the mission of boosting the number of federal teleworkers and the number of teleworkers in other sectors.<sup>23</sup>

The impetus behind the “telework movement” varies across sectors. The federal and state governments frequently point to congestion mitigation and environmental considerations as their primary motivations for encouraging telework. The Clean Air Act of 1990 authorized telecommuting as an optional strategy for clean air compliance and for achieving congestion mitigation goals, such as those found in U.S. Department of Transportation’s efforts to promote telework.

In contrast, the far more numerous private sector initiatives to promote telework with their employees are motivated by financial and human resource objectives. Results from telework studies produced by AT&T, IBM, Merck and other corporations focus on bottom line savings, increased productivity, and worker

satisfaction as the most important benefits of telework. Therefore, recent increases in private sector telework initiatives can be attributed to expectations of cost savings, and the perception telework options help attract and retain qualified workers in a tight labor market. Dramatic reductions in computers and telephone costs and reductions in the cost of Internet access (especially high bandwidth) sharply cut telework expenses. The price of a home computer that can perform basic word processing, e-mail, and other office suite functions has dropped from \$2,500 to \$700 since 1995. Low-cost, \$50 per month, cable modems and DSL high bandwidth solutions enable corporations to establish affordable, secure, high speed connections between their corporate LANs and remote work locations.

The emergence of the digital economy in the 1990s vastly expanded the potential for performing jobs in telework arrangements. Today, it is much easier to identify jobs that are *not* teleworkable. The *Work Trends — Nothing But Net* report found that 68% of workers use a computer each day; 68% have access to a computer at home; and, 41% believe that their job lends itself to teleworking all or part of the week.<sup>24</sup>

### **The Size of the Telework Population**

Due to different sampling methodologies and different definitions of telework, current estimates of the number of teleworkers in the United States vary from 13 million to 19 million. What is clear, however, is that substantially more Americans are teleworking than just a few years ago.

Based on the May 1997 Current Population Survey (CPS), the U.S. Department of Labor, Bureau of Labor Statistics estimates that 21 million Americans did some work at home for their primary employer. After removing 4.1 million self-employed individuals, that suggest that as many as 17 million people could have been teleworking in 1997. Of these workers, 3.6 million are wage and salary workers doing work at home for their primary employer for pay. In 1991, only 1.9 million wage and salary workers were doing work at home expressly for pay. (Not included in these estimates are workers not expressly paid to work at home, such as individuals who telework informally or bring additional work home during the evening).<sup>25</sup>

Two privately funded surveys using similar methodologies ask direct questions about the number of days per month one teleworks. The *Work Trends* surveys define telework as “working from home or a location other than your job’s main location.” The surveys by Telework America define telework as “working at home for an outside employer.” A *Work Trends* survey of 1,000 American workers conducted in March 1999 estimates that 7% of the working population or approximately 9.9 million workers teleworked at least one day per week. A followup study of 1,000 workers in February 2000, estimated that teleworking for at least one day per week had grown to 9% of the working population or approximately 13.3 million workers.<sup>26</sup>

Another survey sponsored by Telework America conducted in September 1999 by the telework researcher and consultant Joanne Pratt and the firm Find/SVP estimates the number of teleworkers at 10% — or slightly more than 19.6 million people — of all U.S. adults over the age of 18.<sup>27</sup> This survey contacted approximately 12,000 U.S. households. In looking at the growth of telework, Telecommute America estimates that the number of Americans who work from home has increased five fold in the last decade, from 4 million in 1990 to more than 11 million in 1997<sup>28</sup> to approximately 19.6 million in 1999.

## The Profile of Teleworkers<sup>29</sup>

The typical U.S. teleworker is a college educated, white, 34- to 55-year-old male who earns more than \$40,000, owns a computer, and works in a professional, managerial, clerical, or technical occupation, according to the *Work Trends* series. This typical teleworker is very likely to be highly satisfied with his job, unconcerned about the unemployment rate, but somewhat concerned about job security. The demographic characteristics of the telework population vary significantly from those of the general working population. Teleworkers, are more educated, have higher incomes, and are more likely to be white and male than the general working population. More than a third (34%) of teleworkers work one day from home or another location, 35% work between two and five days from a remote location, and close to a third (30%) telework full-time (see Table 1).

**Table 1: Days Teleworking Per Week**

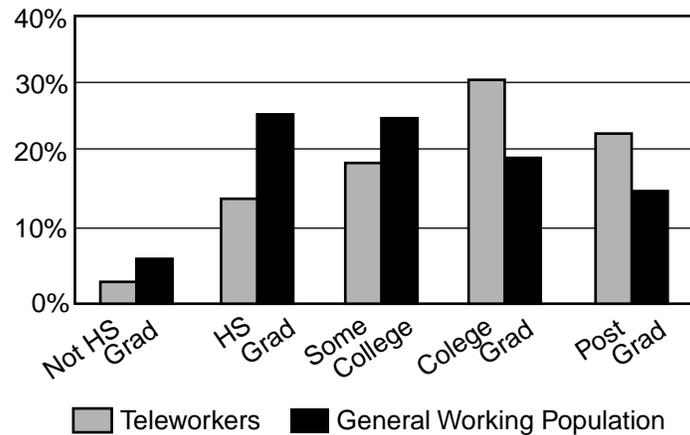
Number of Days	Percentage of Teleworkers
1	30%
2	17%
3	12%
4	5%
5	17%
6	7%
7	10%

The assumption that teleworkers tend to be upper income, white men, from large corporations is fairly accurate. More than half (57%) of teleworkers; are men, and the vast majority are white (76%) with African-American workers making up only 5% and workers of Hispanic origin making up only 7% of the telework population. African-American workers are underrepresented in the telework population, as they constitute approximately 12% of the working population are only 5% of the telework population.

Compared to the general working population, the vast majority of teleworkers earn higher incomes and have more formal education. Almost three-fourths of teleworkers (74%) earn more than \$40,000 per year and 44% earn more than \$75,000 per year. In the general working population, only 61% of workers earn more than \$40,000 a year and only 23% earn more than \$75,000 per year. More than half of teleworkers (58%) are college graduates and a quarter (25%) have received some post-graduate education; only 4% of teleworkers have a high school degree or less.

The age distribution of teleworkers reflects that of the general working population. Half (50%) of all teleworkers are Baby Boomers (35-54) as compared to a third (34%) being Generation Xers (18-34) and only 16% being older workers (55 plus). Surprisingly, Generation X workers do not make up a dispropor-

### Education Level - Teleworkers and the General Working Population

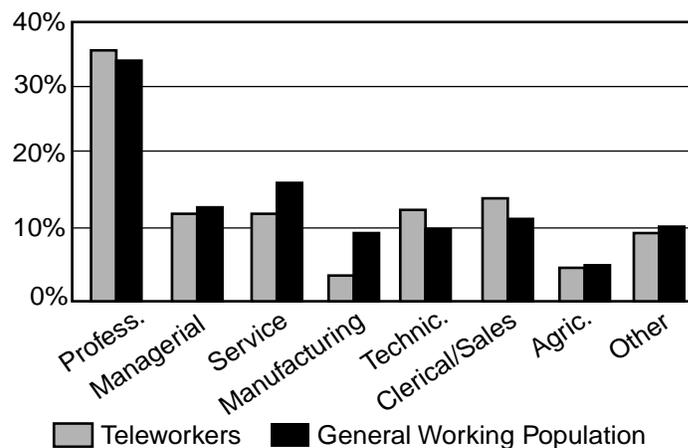


tionate share of the telework labor pool as only a third (33%) of the general working population are Generation Xers.

Teleworkers tend to work for large or small companies. Similar to the general working population, close to half (44%) of teleworkers are employed at organizations with 250 or more workers and 37% work for organizations with less than 25 people. More than half (57%) of teleworkers work at private, for-profit businesses with the balance reporting that they are self-employed (19%), work at a not-for-profit organization (13%), or work for a government entity (11%). Teleworkers are more likely to be self-employed and less likely to work for a government entity than the general population of workers.

Not surprisingly, teleworkers are concentrated in professions that rely heavily on phones, computers, and other information technology devices. The top occupations held by teleworkers are professional (37%), clerical and sales (14%), technical (12%), service (12%), and managerial (12%) jobs. Few teleworkers hold agricultural, processing or manufacturing jobs.

### Occupation of Teleworkers, General Working Population



## Telework Job Opportunities

The number of companies that offer telework options is growing; the sectors of the economy with high numbers of teleworkable jobs are growing; and a high percentage of workers believe that they could telework, if given the opportunity. The Society of Human Resource Management 1998 Benefits Survey found that 24% of human resource professionals say their companies offer telework.<sup>30</sup> A Hewitt Associates survey reported that the number of large companies offering telework was 27% in 1998.<sup>31</sup> A 1997 Telecommute America Survey of 200 Fortune 1000 executives — more than three-fourths representing manufacturing or service companies — concluded that 64% allowed their employees to participate in some form of telework, either from home or another location. Of these companies, the majority (68%) had informal telework agreements with employees, rather than formal telework programs. More than half of the companies not offering telework opportunities anticipate that they will do so within the next three years.

Although these surveys provide evidence that telework is becoming accepted among certain employers, a definite gap exists between the number of employees who say they could perform their job from home, and the number of employees that work for employers that offer telework options. Less than one-fifth (16%) of respondents to *Work Trends — Nothing But Net* study indicate that their employers offer them the option of teleworking, either from home, another location, or both. In stark contrast, 41% of workers say they could perform their job at a place other than their current place of employment if they had access to a phone, fax, and a computer with Internet access.<sup>32</sup>

*Work Trends* national surveys also found that workers with a higher level of education are the most likely to report that they can perform their job from someplace other than the workplace, with 46% of college graduates and 48% of workers with a post graduate education holding positions they believe can be performed outside the office. In comparison, only 35% of people with a high school education think they could perform their job functions at a place other than work. Workers who earn less are less likely to have telework opportunities. Among those working for employers who offer teleworking, 40% of those earning less than \$40,000 per year are not allowed to telecommute, as opposed to only 23% of those earning more than \$40,000.

The potential for teleworking varies by industry. A survey of Houston employers conducted by Joanne H. Pratt Associates examined the prevalence of telework by industry, including mining (oil and gas), construction, manufacturing, transportation, wholesale, retail, finance-insurance-real estate, and services. The results indicate that every industry except retail utilized telework strategies to some degree, and are considering implementing telework in the future (see Table 2).<sup>33</sup>

Although these results cannot be extrapolated, they are suggestive of patterns that may occur in industries in other areas of the country. Industries such as wholesale, mining, and services are engaging in a high level of telework. In contrast, retail and manufacturing have low levels of telework because the nature of the work performed by employees, such as assembly line workers, restaurant wait staff, and checkout clerks cannot be accomplished at home. Pratt attributes the low incidence of telework in transportation, finance, insurance, and real estate to corporate culture and manager resistance, despite the prevalence of phone and data-related jobs in these industries.

**Table 2: Telework status and plans in a survey of Houston employers by industry  
(Joanne Pratt Associates)**

<b>Industry</b>	<b>n size</b>	<b>Currently has Telework (% of industry)</b>	<b>Considering Telework (% of industry)</b>
Mining (oil & gas)	22	46	22
Construction	10	14	29
Manufacturing	33	17	28
Transportation	10	26	26
Wholesale	10	51	44
Retail	7	0	0
Finance, insurance, real estate	13	25	8
Services	56	37	37

### **The Expanding Telework Market**

A number of economic trends indicate that industries with large concentrations of teleworkable occupations are expanding. The explosion of e-commerce has fueled the dramatic growth of the information technology industry as well as the expansion of “back-office” operations that provide the customer support and data processing functions for companies conducting business over the phone and Internet.

A number of finding and projections from different sources<sup>34</sup> all point to the explosion of commerce in the United States:

- The U.S. Government finds that the use of the Internet and electronic billing instead of first class mail will cost the Postal Service \$17 billion over the next ten years.
- North America will lead global e-commerce to \$6.9 trillion in 2004 and U.S. business trade over the Internet will skyrocket to \$251 billion in 2000, up from \$109 billion in 1999, according to Forrester Research.(April 2000)
- Cahners In-Stat Group reports that the U.S. business Internet Service Provider (ISP) market will be worth \$63 billion in 2002 and that small businesses will spend \$51 billion on Internet services in 2002. (November 1999)
- According to IDC, the U.S. ISP market will add nearly \$4.5 billion of revenues annually over the next three years. (April 1999)
- Forrester Research predicts that the U.S. e-commerce services market is expected to reach 64.8 billion in 2003 and that U.S. online retail revenues will hit \$38.8 billion in 2000, up from \$20.3 billion in 1999.

An expanding e-commerce economy will yield more demand and opportunity for teleworkers. In addition to the explosive growth of high-tech, high wage jobs, e-commerce has contributed to the expansion of “back-office” work, which can be done by people with the basic skills of the new economy: traditional literacy, computer literacy, interpersonal skills, and phone/language skills. Having this set of skills will enable workers to take advantage of telework opportunities created by the e-commerce.

The growth of “back-office” operations has also increased in the number of teleworkable jobs and may create urban and rural job opportunities and jobs for individuals with disabilities. The term “back office operations” refers to a broad range of business support functions that are increasingly located in “decentralized and often remote office[s] where links to the parent company or consumer are made via phone or computer.” This decentralization is accomplished by moving functions that do not need to be conducted at the corporate headquarters to satellite back offices or by “outsourcing these functions to companies specializing in back office operations.” Firms and agencies establish back office operations away from corporate headquarters to increase efficiency and productivity without being subject to the same space and workforce availability constraints present at the headquarters site, and without being subject to the same pay scales present at the headquarters site.<sup>35</sup>

The “back office” sector supports companies that provide a wide range of services, including banking and investment, medical insurance, property insurance, telecommunications, and travel planning. This sector also supports numerous government agencies, such as the U.S. Postal Service and the Internal Revenue Service, that provide a wide range of services to the public. Back office operations encompass jobs in telemarketing, mail order call centers, bookkeeping, payroll processing and billing records, data collection and entry of records, and production of reports for corporate firms.<sup>36</sup>

This sector can be divided into two distinct areas: call centers/telemarketing and administrative/ processing operations. Call centers serve a variety of customer service and business development functions. Outbound call centers focus on generating business and sales via telemarketing; inbound call centers provide customer service and respond to customer inquiries. Because inbound call centers require higher skills, employees receive slightly higher pay (\$10 or more/hour) than outbound center employees (\$79/hour).<sup>37</sup> Over 3 million Americans currently work in call centers and the majority work fulltime. The industry is expanding rapidly — 20% per year — and is experiencing severe labor shortages due to burnout, relatively low pay, and the tight labor market.<sup>38</sup>

The other component of the back office sector is administrative and processing support operations. Large and small companies, as well as government agencies, generate an enormous volume of work that requires the processing of data and forms. With advances in telecommunications, firms are moving administrative and processing operations to outlying areas and overseas.<sup>39</sup>

Factors that attract back office operations to a community include: an available and qualified labor force, lower wage rates, and the availability of low-cost real estate tailored to the needs of the industry. Telecommunications infrastructure is also a key factor in location decisions. Areas of the country that are plugged into sophisticated and reliable networks are more attractive to the back office operations industry.

Finally, the language capabilities of a labor force are another key factor. Back office operations providing customer services are especially interested in hiring multilingual employees to handle inquiries from an increasingly global and multilingual customer base.

While new technologies, including the Internet and sophisticated computers, enable some back office employees to work at home, most employees work on-site in large warehouse facilities. Essentially, these facilities are telework centers, since they communicate with corporate headquarters and customers via phone or computer. However, according to experts, new advances in telecommunications technology soon will enable more back office employees to telework from home. This development will be especially significant for people with disabilities and inner city residents who want or need to work at home.

An estimated 25-40% of inbound call center employees will be working from home within the next five years, according to a recently released study by the Gartner Group, a corporate research firm. While some experts in the telework field are skeptical about these estimates, few doubt that there will be significant growth in this labor market.<sup>40</sup>

The federal government has recognized this trend, too. In 1999, the President's Task Force on Employment of Adults with Disabilities recommended that the President "direct all federal agencies with customer service call centers and other appropriate services to explore ways to encourage hiring people with disabilities" to be home-based customer service representatives.<sup>41</sup>

Due to limits associated with telecommunications technology, at-home call center employees must work in the same area code as the corporate headquarters. Currently, incoming calls to at-home customer service agents can only be routed within the same area code as the corporate headquarters, which receives the initial call and routes it to the at-home employee. Consequently, firms cannot expand their telework operations to employees in other regions or states. For example, the Willow Corporation of Miami, Florida is recognized as one of the most advanced call centers in the country in terms of incorporating telework into its operations. The firm employs 900 "cyber agents" in Miami, 3% of whom are people with disabilities. Willow's employees are at-home independent contractors who are assigned to a minimum of three different corporate clients. As routing technology improves, Willow plans to train employees at home and to expand its hiring to include telework employees outside of the Miami area.<sup>42</sup>

Similarly, advances in technology will eventually allow administrative and processing support operations to be conducted by at-home teleworkers. These operations will soon involve the electronic processing of documents and records so that these items can be accessed electronically. The scanning of these documents so they can be accessed in this manner is an enormous task and will create many new job opportunities. As technology improves, these jobs will no longer have to be conducted on-site in close proximity to filing systems; instead, these 43 jobs will be transferable to home-based work.<sup>43</sup>

# The Future Of Telework

## Growth Trends

Many factors point to an increase of telework in the United States. Among the most important are:

- declining technology and telecommunications costs;
- growing investments in digital technology and digital infrastructure;
- increasing demand for information technology sector jobs;
- increasing use of computers in the workplace;
- increasing leverage of workers in tight labor markets who demand telecommuting opportunities; and
- encouraging initial research on the financial and environmental benefits of telework.

The potential for growth in telework also depends on its successes and failures. In the private sector, hundreds of large companies have implemented formal telework programs. Notable among them are AT&T, Merrill Lynch, Bleacher, Prudential, LexisNexus, IBM, Mobil Oil Corporation, United Airlines, Cisco Systems, and Johnson & Johnson. Companies such as Moo Media (a 30 person entertainment business in Hollywood, California) and Paddock Swimming Pool company in Rockville, Maryland, suggest that telework can be used successfully to improve the productivity and performance of smaller firms, as well.<sup>44</sup> Each of these firms has succeeded in implementing telework and serves as an example to other private sector firms who have yet to take the plunge.

## Barriers

Although conditions exist for dramatic increases in telework, significant barriers remain. Many employers embrace an industrial management style not conducive to managing teleworkers. Second, the potential financial advantages of telework are not universally understood or realized by employers and the evidence is not sufficiently persuasive. Many employers still regard telework as cost-prohibitive or lack the management expertise to implement telework programs. Finally, several public policy issues that influence telework are unresolved. Examples of important public policy issues include the interpretation and application of OSHA regulations for home office work, the success of tax incentives encouraging telework, and use of telework as an urban and rural economic development strategy.

The mindset of managers is widely regarded as a significant barrier to the growth of telework in the American economy. Firms that prefer to manage by seeing and checking on employees resist the idea of teleworking because of a “fear of loss of control.”<sup>45</sup> Human resource managers reported in a survey that the main obstacles to teleworking are the lack of supervision of employees, the absence of upper management support, and concerns about communicating with employees.<sup>46</sup> For telework to grow more rapidly, managers will be required to emphasize results, rather than attendance. Interestingly, software exists to monitor

workers' output based on the number of keystrokes performed, time online, and tasks completed. Despite fears that managers will lose control over low-wage workers if they are not in sight, the digital management tools are more effective in tracking the performance of this strata of workers than they are for monitoring mid-level and more senior staff whose work products are less quantifiable.

“Corporate culture” or the customs and expectations of businesses present another barrier to the growth of telework. In a study by Joanne H. Pratt & Associates, 35% of employers in the Houston area cited corporate culture as a major barrier. One respondent representing a law firm stated, “We have no inclination towards telework. Law work is not set up for it except possibly accounting.”<sup>47</sup> Another aspect of corporate culture is what is considered “legitimate” in the business world. For many home-office entrepreneurs who have teleworked, moving into an office suite lends legitimacy to their venture and a more professional corporate image. One executive suite tenant also points out, “When you're on your own, you get in your own little world and lose sight of what's going on. Here you can share war stories.”<sup>48</sup>

## Projections

Many economists, social scientists, and business leaders project the growth of e-commerce, the information economy workforce, and the teleworkforce. Getting precise projections is rather difficult due to the myriad of factors that can and will affect the growth of telework in the United States. Among the most important ones are:

- federal and state public policy including tax incentives and OSHA interpretations;
- corporate management practices;
- technology advances; and
- technology and telecommunications costs.

The information economy is a relatively new phenomenon (1990s). Dramatic technology advances and cost reductions in computer and telecommunications technologies occurred during this same period. What will happen in this decade and beyond is anybody's guess.

One projection of growth in telework, however, may be derived by extending out the CPS survey findings from 1991 and 1997. Using those working at home for pay as a proxy for teleworkers, the CPS found there were 1.9 million such individuals in 1991 and 3.6 million in 1997. If that growth rate continues, by the year 2003 the number of teleworkers would be 5.3 million and by 2009, 7 million.

Taking a more expansive definition of telework and using the results of the 1999 and 2000 *Work Trends* data set results in a much higher estimate. In 1999, *Work Trends — Balancing Work and Family* reported that 7% of the working population were teleworkers; in *Work Trends — Nothing But Net* (2000), the teleworking population was 9%. Assuming a 2% annual increase in the percentage of the workforce that teleworks and holding the general working population constant at today's level, we could project that 15% of the workforce, or 21 million workers, will be teleworking in 2003 and 27%, or 38 million workers, will

be teleworking in 2006. Either method of projecting the future telework population is flawed, but either is illustrative of the huge potential for telework in the U.S. labor force.

## **Public Policy and a Telework Research Agenda**

Market forces have created a climate where telework could expand dramatically, redefining the very nature of work for many Americans. Public policy decisions by federal, state and local governments and the business decisions of employers will greatly shape the extent to which change really happens. The public sector plays three distinct and important roles.

### **The Public Sector Can Either Hinder or Facilitate the Adoption of Telework Through Laws and Regulations**

In December 1999 the Occupational Safety and Health Administration (OSHA), a unit of the U.S. Department of Labor, faced a storm of media coverage as a seemingly benign in-house memo took center stage in national headlines. This little known “letter of interpretation” inferred that employers would be liable for federal health and safety violations that occurred in the homes of employees who chose to telework.<sup>49</sup> This memo set off a firestorm of criticism from employers and labor law experts alike who saw this as an unnecessary impediment to the changing nature of the workplace.

This memo was generated by an inquiry from an employer who requested guidelines from OSHA on home-work arrangements for himself and his employees. OSHA responded to the employer by letter, as is often the case when providing technical assistance to employer inquiries. However, the letter from OSHA resulted in great fear and confusion on the part of employers and telecommuters who felt OSHA inferred that it would make home office inspections of teleworkers a routine occurrence.

Charles Jeffress, Assistant Secretary for OSHA, clarified the agency’s position regarding home inspections in his testimony before the Senate Subcommittee on Employment, Safety and Training on January 25<sup>th</sup> of this year. Assistant Secretary Jeffress stated seven objectives regarding OSHA’s view of home offices and telework: <sup>50</sup>

- OSHA does not apply to an employee’s house or furnishings;
- OSHA will not hold employers liable for work activities in employees’ home offices;
- OSHA does not expect employers to inspect home offices;
- OSHA does not and will not inspect home offices;
- 20% of employers, because of their size or industry classification, are already required by OSHA to keep records of work-related injuries and illnesses. These employers are responsible for keeping such records regardless of where the employee is injured, including in a home office;

- If work other than office work is performed at home (such as manufacturing or work involving hazardous materials), employers are responsible for any hazardous materials, equipment or work processes that they provide or require to be used in an employee's home; and
- OSHA will only conduct inspections of hazardous home workplaces, such as home manufacturing, when it receives a complaint or referral.

It is clear from these remarks that OSHA and the Department of Labor are not targeting telecommuters and their employers with stringent oversight and cumbersome rules. Telework is subject to the same labor laws developed over a half century ago for a less technologically sophisticated workplace. Even though OSHA quickly rescinded the memo, many proponents of telework feel that this negative publicity added to the ammunition that employers use to discourage telework.<sup>51</sup>

The origin of much of U.S. employment law can be found in the National Labor Relations Act (NLRA). Created over a half century ago, the NLRA came about during a time when the U.S. economy was based on manufacturing. Rapid changes in technology and the workplace, particularly during the past 20 years, pose challenges to the NLRA statutes. Questions regarding employee safety and health and employer liability are just two areas that need to be addressed in the NLRA. Another area concerns the unionization of the at-home work force and their rights to organize under the NLRA. The NLRA and the National Labor Relations Board are charged with the responsibility of protecting a worker's right to representation on the job, most typically through a union. However, they have traditionally protected this right by stipulating that employees work at the same location or share similar job activities in order to have the right to organize. Labor advocates object to telework arrangements without clarifications and/or changes to these policies because they infringe on a worker's right to organize.

### **The Public Sector Can Provide Financial Incentives to Encourage Telework**

To date, neither the federal nor state governments have enacted successful tax incentives to promote telework, but many proposals are under consideration. The tax incentives intended to encourage telework are not substantial enough to convince private firms to institute formal telework policies. Some telework experts also suggest that corporations and workers simply do not care enough about the perceived environmental benefits to institute telework programs. Consultant Gil Gordon suggests that if the legislation included mandates to reduce "traffic congestion" instead of "pollution" many more employers would be willing to explore telework options.<sup>52</sup> Other telework advocates, including Adele Clark, Director, Keep Middlesex Moving (KMM) and Erin Indelicato of the New Jersey Clean Air Council echoed this sentiment.<sup>53</sup>

Legislation to increase the visibility and viability of telework is being crafted at the state and federal level. New Jersey Assemblyman Michael Carroll introduced a bill encouraging telecommuting in 1998 at the suggestion of a businessman who was interested in easing traffic congestion and reducing "road rage." The bill proposes a 1% tax credit against an employer's corporation business tax and gross income tax proportionate to the telework employee's salary.

The actual tax credit would be calculated on the percentage of the employee's work done at home. Several stipulations were attached to the tax benefit making it somewhat onerous for employers. Companies would have to clearly articulate a formal telework policy and the tax credit would only apply to employees living in New Jersey. The projected tax revenue impact was not included in the original legislation, but it is not expected to be significant.<sup>54</sup>

Federal lawmakers are also attempting to advance telework through national policy. A bill introduced in 1999 (H.R.2556) is designed to create pilot telework programs as a means of reducing air pollution and congestion. The chief sponsors, Congressman Frank Wolf of Virginia and Senator Rick Santorum of Pennsylvania<sup>55</sup> propose five pilot areas including the greater Philadelphia metropolitan region. The legislation not only touts the benefits of telework to the environment, specifically air quality, but to national, state and local transportation infrastructure and the quality of life for individuals, their families and the community as a whole.

Congressman Wolf also introduced legislation in March 2000 to permanently amend the Internal Revenue code of 1986 to address the benefits of telework for employees. His proposal outlines stringent requirements on the kinds of telework arrangements that would qualify under the tax credit system. Congressional findings indicate that traffic congestion cost \$74 billion annually in lost work time, fuel consumption, and infrastructure and equipment repair. Congressman Wolf's bill argues that if 10 to 20% of commuters switched to telework, 1.8 million tons of regulated pollutants would be eliminated, 3.5 billion gallons of gas would be saved, workers would free up 3.1 billion hours of personal time up, and infrastructure costs would decrease by \$500 million annually.<sup>56</sup> The maximum tax credit called for in this bill is \$500 for individuals who telework for the entire tax year. Those in telework arrangements for less than a year would see their credit reduced according to their time spent as teleworkers. The bill also urges companies to be more specific about their telework policies and to have a specific policy in place for employees who wish to take advantage of telework opportunities.

Another key piece of proposed legislation is H.R. 3500, which focuses on educating and assisting small businesses to create and implement telework programs. This bill, introduced in 1999, directs the Administrator of the Small Business Administration to conduct pilot programs that raise awareness about telework among small business employers and to encourage employers to offer telework options to employees.<sup>57</sup> The bill authorizes the appropriation of \$500,000 for fiscal year 2001.

### **The Public Sector Can Promote the Application of Telework to Achieve Social Goals**

As discussed above, telework holds out the potential of increasing employment for low-income and disabled individuals, helping working parents gain the flexibility to meet their child care needs, helping all workers balance work and family, and closing the digital divide. A national research and demonstration project creating telework centers in urban and rural communities, would test this strategy and encourage private firms to locate back-office operations in low-income communities in the United States instead of outsourcing this work to suburban communities or to communities located in other countries.

## The Public Sector Can Conduct Valuable Research Into the Many Unresolved Questions about Telework

In particular, the federal government should consider examining the following research questions:

- **Who are teleworkers?** A systematic, sustained study of the number, characteristics, and travel behavior of teleworkers would provide important information for policy makers and corporate decisionmakers.
- **What are the longterm impacts of telework on travel behavior?** Using data from longitudinal studies proposed above and case studies of communities with high percentages of telework jobs, researchers should explore the long-term effects of telework on congestion mitigation and transportation demand.
- **What are the effects of tax incentives?** Research should evaluate and compare the effectiveness of various state tax incentive programs.
- **Can telework be an effective economic development strategy and help bridge the digital divide?** An urban and/or rural telework demonstration program should be mounted to evaluate the effectiveness of telework for increasing employment, reducing poverty, and bringing technology infrastructure into “digitally divided” communities.
- **What are the effective digital management strategies?** As the nature of work and work processes changes with the mass application of telework, more research is needed into the most effective approaches to identifying and managing teleworkers.
- **What changes in education and training are necessary to prepare the workforce for an “any-time, anywhere” work culture?** As the need for computer literacy grows with the prevalence of computers in the workplace, research is also necessary to understand better the education and training needed to ensure that workers can perform in these new skills.

## Conclusion

Although estimates vary, telework is increasing and will continue to grow in this decade. Millions of workers believe they can effectively perform their job by telecommuting for at least part of the workweek and want to do so. Growing numbers of employers are offering employees the opportunity to telework, and many others are examining the costs and benefits of such a strategy. Recent advances in technology and the availability of powerful home computers and high speed Internet access are enabling more people to escape the confines of the traditional office. The war for talent has forced employers to deploy a host of strategies, including telework, to attract and retain valuable workers. Even companies that are skeptical of these approaches may be forced to adopt telework and other strategies to compete in the changing economy. Amidst this war for talent and the demand for computer-literate workers in the new economy, many are still left behind. Those left behind are bound by their isolation from jobs, from access to the Internet, from a system of education and training that will enable them to be successful.

The long-term environmental, social, and fiscal costs and benefits of telework are unknown. But, the initial evidence is persuasive enough to justify targeted intervention. The federal government can accelerate the potential benefits of telework for more workers and employers by promoting its understanding and application through law, fiscal incentives, demonstration projects, and research.

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## **Introduction**

The information provided by the authors is comprehensive, addressing the state-of-the-art and industry relative to telework. Key points covered include the reasons telework can be successful, as well as potential hindrances to achieving that success. Important among the issues that telework can positively influence are improving access to the workforce, particularly for historically disenfranchised workers. Evidence of advantages resulting from telework, including increased worker productivity, reduced operating expenses for the employer and improved employee morale, is offered through surveys assessing experiences of national telework programs. The authors are to be particularly commended for the breadth and depth of sources and industry contacts included as part of the paper. Early in the paper, Van Horn and Storen establish that it is important for telework to be better understood in order to increase its level of implementation. This notion is supported by their recommendations for additional research and exploration into long-term impacts.

## **Theories of Management**

The authors raise the issue of appropriate management in the digital environment. The idea from the manager's perspective is to learn how to manage the worker's productivity more than the worker. Thus, the individual worker is managed with an eye toward encouraging the highest level of performance following McGregor's theory (that worker's want to perform well) or Maslow's theory of self-actualization.<sup>1</sup>

Workers are concerned with the long-term effect on traditional organizational practices including career paths and management structure. For instance, the following are unknown:

- What is a career path for a teleworker? Will the next promotion go to the person at home with an "x%" productivity record or the person down the hall with slightly lower statistics, but a more well rounded work history? In theory, the latter would have shown the ability to "get along" with colleagues.
- Can the teleworker develop the skill set to be a good manager working for a long period at home?

These two questions reflect only the "tip of the iceberg" of the next stage of issues for telework. A number of companies will need to grapple with these questions in order to determine the appropriate responses.

## **Access to High Speed Secure Information Technology**

Van Horn and Storen reference the availability of high speed and secure Internet connections. It should be noted that while extraordinary advances have been made, those capacities are not yet available for all areas. Notably, suburbs and rural areas lack the high-speed connections. For example, communities outside an 8-mile area of central Houston are unable to get DSL. Although this particular problem will likely be solved in the near-term, it is indicative of the type of recurring issue that may arise in a rapidly changing technological environment.

This brings up another potential issue — maintaining system compatibility. Most individuals working in an office environment have experienced their company’s systems’ maintenance personnel visiting each office to install “something” that upgrades the capabilities, modifies the software or otherwise improves the system’s operation. Companies with large telework components must become prepared to effectuate similar upgrades on a number of remote worksites. Managing this type of organizational activity is an additional issue to be included in the “management practices” referenced by Van Horn and Storen. This is more difficult if the company’s telework arrangements are informal.

The potential of telework and satellite work centers to redress the inadequate job linkages to suburban jobs for many inner city residents is described. Although seemingly an extremely attractive option, the concept is complicated, involving many pieces and many actors. It is most important that appropriate workers be identified and trained, and that someone underwrite this cost. Worker education and the acquisition of computers, software, and systems must be coordinated. Which actor(s) should initiate the education and capital investment — government, the private sector, or some combination of both?

Additionally, there may be outstanding questions about the viability of these centers. As many as 25 satellite centers operated in California while a government subsidy was available; once the funding ended, the centers closed.<sup>2</sup> Future research should examine why the centers did not remain viable. Questions may include the following:

- Was continued financing unavailable from other sources?
- Was there no “champion with influence”?
- Were the centers not efficient?
- Were there other business-oriented issues contributing to their demise?

## **What is the most cost-efficient path to promote telework?**

For a number of reasons, telework holds great promise for many areas. A short-term strategy to promote telework may be to spotlight one or two of these reasons, and provide accompanying success stories. For example, in areas with poor air quality or intense traffic congestion, telework’s potential to improve air quality and alleviate congestion could be emphasized. The goals, costs and benefits of telework programs should be highlighted.

## Short-term and Long-term Perspectives

The issues addressed by Van Horn and Storen can be viewed as those benefiting the telework advocates in the short-term, and those requiring a longer assessment. Van Horn and Storen write that the longitudinal market responses to telework are unknown and require analysis. Attendant to that is the question of the teleworker’s “life-cycle.” How long does a teleworker maintain that job status? If they change jobs, do they seek another telework environment? Answers to these questions will assist in assessing the viability of telework as a career option. It may be that telework is more attached to the job function, as opposed to the individual worker. In any case, it may be extremely difficult to isolate the “telework” contribution to the complex list of variables that enter into relocation decisions. Table 1 below lists recommendations for future research (see shaded cells) and suggests additional topics (see unfilled cells).

## Areas for Targeted Research

The Van Horn and Storen paper list several research questions to be addressed. In addition, the following are offered:

- *Explore incompatibility of advances within regions.* The current example is that of DSL which increases the speed at which messages and processes are conducted. As discussed above, this

**Table 1**  
**Short-Term and Long-Term Recommendations\***

Short-Term Recommendation	Long-Term Recommendation
Who Are Teleworkers?	Can Telework Bridge the Digital Divide?
What are Effective Digital Management Strategies?	Impact of Telework and Travel Behavior
What Changes Are Necessary in Education?	What are the Effects of Tax Incentives?
Inconsistent DSL and other technological capabilities	Mainstreaming Telework as a Work Option
Clarify Advantages of Telework	Appropriate Share of Telework to Traditional Employment
Define Measurable Goals and Objectives	Formal vs. Informal Telework Arrangements

\*Shaded cells represent Van Horn/Storen recommendations; unfilled cells represent Lewis recommendations

technology is available only selectively throughout the Houston region. Undoubtedly this is a temporary circumstance, but is likely to be reflective of the “next upgrade” as well. So that Companies can accommodate those working from home, disparate technological access and capabilities, they must structure a company response to this circumstance. While perhaps requiring a non-programmed, specific response, companies may design “non-standard” responses within some “standard parameters.”

- *What are career paths for teleworkers?* Is there a way to achieve promotions and recognition in the non-traditional work environment?
- *Are there issues regarding economies of scale?* For instance, is there a point where an individual company might be too dispersed such that the productivity gains that are generally observed for teleworking do not materialize? This may be a particularly difficult issue because the point, if it exists, will be different for all companies.

## Parting Thoughts

Van Horn and Storen suggest greater visibility with focused government support for implemented projects. In conjunction with such increased focus, national goals for telework programs in this country should be clearly defined. “More teleworkers” is too nebulous. Reasonable, measurable program objectives and the anticipated positive community impacts should be articulated.

A new initiative often requires a catalyst, something to boost it into a position of prominence. Those working in the telework arena may want to identify an issue of general concern as such a catalyst. Options could be the congestion mitigation, emissions reduction or a tax incentive, such as that recently proposed by Congressman Frank Wolf (Virginia).<sup>3</sup> An identifiable, visible, vocal spokesperson, like Congressman Wolf, could also advance the cause. The authors reference the possibility that federal or state governments could partially fund private-public partnerships. This excellent idea must have clear, straightforward, win-win outcomes for the private sector and the government.

## Endnotes

<sup>1</sup> Patrick Montana and Bruce Charnov, “Management,” *Barron’s Business Review Series*, Barron’s Educational Series, Inc., 1993.

<sup>2</sup> Telephone Interview with Elham Shirazi, October 10, 2000.

<sup>3</sup> “Telework Enabling Government Action,” [http://telecommute.org/policy/government\\_action.shtml](http://telecommute.org/policy/government_action.shtml), October 12, 2000.